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 REGION 10

 1200 Sixth Avenue  
 Seattle, Washington 98101


Environmental Cleanup Office

IN REPLY

REFER TO: OEA-095

April 15, 1999

MEMORANDUM
 SUBJECT: Bunker Hill, CLP Metals Analysis, Data Validation  
 Case: 26852  
 SDG: MJAF64

 FROM:  Laura Castrilli, Chemist  
 Quality Assurance and Data Unit, OEA

147872

USEPA SF


 TO: Mary Kay Voytilla, Regional Project Manager  
 Office of Environmental Cleanup

 CC: Bruce Woods, Region 10 CLP TPO  
 Jim Stefanoff, CH2M Hill

The following is a validation of ICP-AES and mercury analyses of six total and six dissolved water samples from the Bunker Hill project. The analyses were performed following the USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis Multi-media, Multi-Concentration, ILM04.0. Analyses were conducted by Sentinel, Inc, of Huntsville, Alabama. This validation was conducted for the following samples:

MJAF64	MJAF66	MJAF68	MJAF70	MJAF72	MJAF74
MJAF65	MJAF67	MJAF69	MJAF71	MJAF73	MJAF75

**Data Qualifications**

The following comments refer to the Sentinel Laboratory's performance in meeting quality control specifications outlined in the CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM04.0. The comments presented herein are based on the information provided for the review.

**1.0 Timeliness - Acceptable**

The technical (40 CFR part 136) holding time from the date of collection for mercury in water is 28 days. The holding time for the remaining metals in water is 180 days. The samples were collected on 03/01/99. Mercury analyses were completed on 03/05/99. ICP-AES analyses were completed on 03/09/99.

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## 2.0 Sample Preparation - Acceptable

The samples were prepared for mercury and ICP-AES analyses on 03/04/99.

## 3.0 Calibrations/Calibration Verifications - Acceptable

The samples were analyzed for mercury by CVAAS on 03/05/99. Initial calibration included one blank and six standards. The curve was linear with a correlation coefficient greater than 0.995.

The samples were analyzed by ICP-AES on 03/09/99. The instrument was standardized according to the analytical method each day of analysis using one blank and a single calibration standard for each element.

All ICP-AES and CVAAS (mercury) calibrations were performed as required and met the acceptance criteria; therefore, no qualification was made on this basis.

Continuing calibration verifications (CCVs) are required before and after sample analysis and after every 10 samples during analysis. Mercury recoveries must be within 80-120%. Other metal recoveries must be within 90-110%. The frequency of analysis of CCVs was met. All ICP-AES and CVAAS (mercury) CCVs (initial and continuing) bracketing reported sample results met the recovery criteria; therefore, no qualification was made on this basis.

## 4.0 Laboratory Control Samples - Acceptable

Laboratory Control samples are digested and analyzed along with the samples to verify the efficiency of laboratory procedures. All recoveries associated with reported sample results met the acceptance criteria for control samples.

## 5.0 Blanks -

Procedural blanks were prepared with the samples to show potential contamination from the digestion or analytical procedure. If an analyte was found in the associated blank, the sample results were qualified if the analyte concentration was less than five times the analytical value in the blank.

No analytes were detected in the preparation blanks. Aluminum, antimony, calcium, iron, manganese, and zinc were detected in one or more ICP-AES continuing calibration blanks (CCBs). Potassium and sodium in a CCB had negative values with absolute values greater than the respective detection limits. Based on blank contamination, associated sample results were qualified as follows:

- ♦ antimony in samples MJAF65, MJAF68, and MJAF69 was qualified 'U'
- ♦ sodium in samples MJAF65 and MJAF67 was qualified 'J'

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All other sample results were greater than five times the associated blank levels (or were already undetected) and were not qualified based on blank contamination.

#### 6.0 ICP-AES Interference Check Sample -

The interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning and end of each sample analysis run and recoveries must be between 80% and 120%. All ICS recoveries associated with reported sample results were within the recovery criterion; with the exception of copper in all three ICS-A samples (average of 75%R, true value of 28 ug/L). ICS-AB copper recoveries were within the 80-120% criteria (true value of 507 ug/L). Copper results were not qualified on the basis of ICS-A recovery as those samples that had interferent levels of iron had copper results nearer the ICS-AB levels.

The raw data for a number of samples had interfering levels of iron. Analytes for which iron is an interferent were qualified as follows:

- ♦ Antimony in samples MJAF68 and MJAF74 was qualified 'UJ', estimated detection limit (possible false positives due to high iron) as antimony in the three ICS-A analyses bracketing these samples had results greater than the detection limit.
- ♦ Vanadium in samples MJAF66, MJAF68, MJAF72, and MJAF74 was qualified 'UJ', estimated detection limit (possible false negatives due to high iron) as vanadium in the three ICS-A analyses bracketing these samples had negative results with absolute values greater than the detection limit.

Some of the samples required one or more dilution runs to report zinc, iron, and manganese results within the instrumental linear range. The raw data for all analytes were compared using the available dilutions to see if 1) zinc, iron, and/or manganese levels in the undiluted samples were high enough that interelement corrections may not be sufficient for the analytes that were reported from the undiluted analyses or 2) a pattern of suppression or enhancement was evident.

From this comparative study, the following results were qualified due to suspected interference (analytes already qualified due interference or due to poor serial dilution results were not qualified again, see section 11 for qualification due to serial dilution):

- ♦ Manganese and potassium were qualified 'J', estimated (pattern of suppression/possible low bias) in samples MJAF66 and MJAF72.
- ♦ Aluminum, calcium, chromium, lead, nickel, potassium, silver, and sodium were qualified 'J', estimated (pattern of enhancement/possible high bias for sodium; pattern of suppression/possible low bias for the other analytes) in sample MJAF68.
- ♦ Aluminum, cadmium, calcium, cobalt, lead, magnesium, nickel, potassium, silver, and sodium were qualified 'J', estimated

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(pattern of enhancement/possible high bias for sodium; pattern of suppression/possible low bias for the other analytes) in sample MJAF74.

#### 7.0 Duplicate Analysis - Acceptable

Duplicate analyses were done on sample MJAF65. Water duplicate results were within the  $\pm 20\%$  Relative Percent Difference (RPD) or  $\pm$ CRDL criteria for water results < 5 times the CRDL criteria.

#### 8.0 Field Duplicate Analysis - Not Applicable

Field duplicate analysis for samples in this SDG was not indicated in the field collection documentation.

#### 9.0 Matrix Spike Analysis -

Matrix spike sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. Matrix spike recovery must be within the limits of 75 - 125%.

Matrix spike analyses were done on sample MJAF65. All matrix spike recoveries were within the required QC limits, with the exception of antimony (74.5% recovery) and selenium (148%). All detected selenium results were qualified 'J', estimated (possible high bias). Since the antimony recovery was only slightly outside the criteria, antimony results were not qualified based on matrix spike recovery.

#### 10.0 Graphite Furnace Atomic Absorption Spec (GFAAS) QC - Not Applicable -

GFAAS was not used for the analysis of these samples.

#### 11.0 ICP-AES Serial Dilution -

Sample MJAF65 was analyzed by ICP-AES serial dilution to check for potential interferences. All analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within the 10%D criteria; with the exception of copper (63%). All copper results were qualified 'J', estimated due to serial dilution results.

#### 12.0 Detection Limits - Acceptable

Sample results which fall below the instrument detection limit (IDL) are assigned the value of the instrument detection limit and the 'U' qualifier is attached. Contract Required Detection Limit (CRDL) standards are required to demonstrate a linear calibration curve near the CRDL. CRDL standards were run at the required frequency.

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### 13.0 Overall Assessment of the Data

This validation of the data is based on the criteria outlined in the *National Functional Guidelines for Inorganic Data Review (02/94)*. Approximately 18.1% of the data was qualified based on blank contamination, interference, matrix spike recovery, or poor serial dilution results. The data as qualified is acceptable for all purposes.

Below are the definitions for the National Functional Guidelines for Inorganic Data Review (02/94) qualifiers used when validating/qualifying data from Inorganic analysis.

#### DATA QUALIFIERS

- U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- J - The associated value is an estimated quantity.
- R - The data are unusable. (Note: Analyte may or may not be present.)
- UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

EPA SAMPLE NO.

## INORGANIC ANALYSIS DATA SHEET

MJAF64

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18403S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	679			P
7440-36-0	Antimony	3.5	U	N	P
7440-38-2	Arsenic	31.7			P
7440-39-3	Barium	4.6	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	0.48	B		P
7440-70-2	Calcium	3320	B		P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	7.0	B		P
7440-50-8	Copper	17.4	B	EJ	P
7439-89-6	Iron	14500			P
7439-92-1	Lead	33.3			P
7439-95-4	Magnesium	933	B		P
7439-96-5	Manganese	1180			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	5.0	B		P
7440-09-7	Potassium	713	B		P
7782-49-2	Selenium	3.1	U	N	P
7440-22-4	Silver	0.70	U		P
7440-23-5	Sodium	608	B		P
7440-28-0	Thallium	4.9	U		P
7440-62-2	Vanadium	1.4	U		P
7440-66-6	Zinc	378			P
	Cyanide				NR

12/04/12/99

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

EPA SAMPLE NO.

## INORGANIC ANALYSIS DATA SHEET

MJAF65

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18404S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	505			P
7440-36-0	Antimony	5.0	B	N U	P
7440-38-2	Arsenic	81.8			P
7440-39-3	Barium	15.5	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	68.9			P
7440-70-2	Calcium	8920			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	15.7	B		P
7440-50-8	Copper	85.4		E J	P
7439-89-6	Iron	41000			P
7439-92-1	Lead	1050			P
7439-95-4	Magnesium	5860			P
7439-96-5	Manganese	7100			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	16.4	B		P
7440-09-7	Potassium	1440	B		P
7782-49-2	Selenium	3.1	U	N	P
7440-22-4	Silver	3.1	B		P
7440-23-5	Sodium	480	B	J	P
7440-28-0	Thallium	4.9	U		P
7440-62-2	Vanadium	1.4	U		P
7440-66-6	Zinc	21100			P
	Cyanide				NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

EPA SAMPLE NO.

## INORGANIC ANALYSIS DATA SHEET

MJAF66

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18405S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6830	-		P
7440-36-0	Antimony	3.5	U	<del>N</del>	P
7440-38-2	Arsenic	278			P
7440-39-3	Barium	9.3	B		P
7440-41-7	Beryllium	3.1	B		P
7440-43-9	Cadmium	541			P
7440-70-2	Calcium	28500			P
7440-47-3	Chromium	4.1	B		P
7440-48-4	Cobalt	74.4			P
7440-50-8	Copper	297		<del>EJ</del>	P
7439-89-6	Iron	420000			P
7439-92-1	Lead	884			P
7439-95-4	Magnesium	70100			P
7439-96-5	Manganese	57300		J	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	82.4			P
7440-09-7	Potassium	822	B	J	P
7782-49-2	Selenium	28.7		<del>NJ</del>	P
7440-22-4	Silver	24.8			P
7440-23-5	Sodium	1860	B		P
7440-28-0	Thallium	22.4			P
7440-62-2	Vanadium	1.4	U	J	P
7440-66-6	Zinc	234000			P
	Cyanide				NR

12/04/12/99

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:



## INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJAF67

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18406S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	448	-		P
7440-36-0	Antimony	3.5	U	N	P
7440-38-2	Arsenic	13.7			P
7440-39-3	Barium	19.5	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	42.2			P
7440-70-2	Calcium	9220			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	5.0	B		P
7440-50-8	Copper	18.5	B	EJ	P
7439-89-6	Iron	9750			P
7439-92-1	Lead	152			P
7439-95-4	Magnesium	13400			P
7439-96-5	Manganese	6830			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	6.1	B		P
7440-09-7	Potassium	687	B		P
7782-49-2	Selenium	3.1	U	N	P
7440-22-4	Silver	1.2	B		P
7440-23-5	Sodium	447	B	J	P
7440-28-0	Thallium	4.9	U		P
7440-62-2	Vanadium	1.4	U		P
7440-66-6	Zinc	14200			P
	Cyanide				NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

EPA SAMPLE NO.

## INORGANIC ANALYSIS DATA SHEET

MJAF68

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18407S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	18800		J	P
7440-36-0	Antimony	14.5	B	N UJ	P
7440-38-2	Arsenic	781			P
7440-39-3	Barium	7.7	B		P
7440-41-7	Beryllium	8.4			P
7440-43-9	Cadmium	1390			P
7440-70-2	Calcium	49300		J	P
7440-47-3	Chromium	10.7		J	P
7440-48-4	Cobalt	194			P
7440-50-8	Copper	770		E J	P
7439-89-6	Iron	1310000			P
7439-92-1	Lead	1120		J	P
7439-95-4	Magnesium	96900			P
7439-96-5	Manganese	151000			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	209		J	P
7440-09-7	Potassium	658	B	J J	P
7782-49-2	Selenium	77.7		N J	P
7440-22-4	Silver	65.5		J	P
7440-23-5	Sodium	18900		J	P
7440-28-0	Thallium	57.3			P
7440-62-2	Vanadium	1.4	U	J	P
7440-66-6	Zinc	759000			P
	Cyanide				NR

for 04/12/99

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAF69

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18408S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	437			P
7440-36-0	Antimony	4.7	B	NU	P
7440-38-2	Arsenic	83.0			P
7440-39-3	Barium	15.6	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	65.5			P
7440-70-2	Calcium	8650			P
7440-47-3	Chromium	0.99	B		P
7440-48-4	Cobalt	16.6	B		P
7440-50-8	Copper	66.8		BJ	P
7439-89-6	Iron	40500			P
7439-92-1	Lead	1040			P
7439-95-4	Magnesium	5970			P
7439-96-5	Manganese	7230			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	17.2	B		P
7440-09-7	Potassium	1450	B		P
7782-49-2	Selenium	4.5	B	BJ	P
7440-22-4	Silver	3.3	B		P
7440-23-5	Sodium	498	B		P
7440-28-0	Thallium	4.9	U		P
7440-62-2	Vanadium	1.4	U		P
7440-66-6	Zinc	20600			P
	Cyanide				NR.

2/2 04/12/99

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

EPA SAMPLE NO.

## INORGANIC ANALYSIS DATA SHEET

MJAF70

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18409S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	600			P
7440-36-0	Antimony	3.5	U	N	P
7440-38-2	Arsenic	9.7	B		P
7440-39-3	Barium	15.1	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	0.67	B		P
7440-70-2	Calcium	3330	B		P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	7.5	B		P
7440-50-8	Copper	7.6	B	EJ	P
7439-89-6	Iron	12900			P
7439-92-1	Lead	23.8			P
7439-95-4	Magnesium	942	B		P
7439-96-5	Manganese	1190			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	5.4	B		P
7440-09-7	Potassium	719	B		P
7782-49-2	Selenium	3.1	U	N	P
7440-22-4	Silver	0.70	U		P
7440-23-5	Sodium	744	B		P
7440-28-0	Thallium	4.9	U		P
7440-62-2	Vanadium	1.4	U		P
7440-66-6	Zinc	384			P
	Cyanide				NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

EPA SAMPLE NO.

## INORGANIC ANALYSIS DATA SHEET

MJAF71

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18410S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	521			P
7440-36-0	Antimony	3.5	U	N	P
7440-38-2	Arsenic	70.0			P
7440-39-3	Barium	20.4	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	73.5			P
7440-70-2	Calcium	8930			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	16.6	B		P
7440-50-8	Copper	88.5		HJ	P
7439-89-6	Iron	39900			P
7439-92-1	Lead	1050			P
7439-95-4	Magnesium	6070			P
7439-96-5	Manganese	7290			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	17.1	B		P
7440-09-7	Potassium	1500	B		P
7782-49-2	Selenium	4.1	B	HJ	P
7440-22-4	Silver	2.3	B		P
7440-23-5	Sodium	573	B		P
7440-28-0	Thallium	4.9	U		P
7440-62-2	Vanadium	1.4	U		P
7440-66-6	Zinc	21700			P
	Cyanide				NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

EPA SAMPLE NO.

## INORGANIC ANALYSIS DATA SHEET

MJAF72

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18411S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7070	-		P
7440-36-0	Antimony	3.5	U	#	P
7440-38-2	Arsenic	276			P
7440-39-3	Barium	10.6	B		P
7440-41-7	Beryllium	3.2	B		P
7440-43-9	Cadmium	552			P
7440-70-2	Calcium	28600			P
7440-47-3	Chromium	4.3	B		P
7440-48-4	Cobalt	76.2			P
7440-50-8	Copper	300		BJ	P
7439-89-6	Iron	425000			P
7439-92-1	Lead	840			P
7439-95-4	Magnesium	71100			P
7439-96-5	Manganese	59100		J	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	84.0			P
7440-09-7	Potassium	871	B	J	P
7782-49-2	Selenium	27.6		#J	P
7440-22-4	Silver	21.2			P
7440-23-5	Sodium	2140	B		P
7440-28-0	Thallium	18.8			P
7440-62-2	Vanadium	1.4	U	J	P
7440-66-6	Zinc	243000			P
	Cyanide				NR

12/24/12/99

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

EPA SAMPLE NO.

## INORGANIC ANALYSIS DATA SHEET

MJAF73

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18412S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	477			P
7440-36-0	Antimony	3.5	U	N	P
7440-38-2	Arsenic	10.4			P
7440-39-3	Barium	27.5	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	47.9			P
7440-70-2	Calcium	10500			P
7440-47-3	Chromium	0.72	B		P
7440-48-4	Cobalt	5.7	B		P
7440-50-8	Copper	23.4	B	BJ	P
7439-89-6	Iron	6720			P
7439-92-1	Lead	162			P
7439-95-4	Magnesium	15200			P
7439-96-5	Manganese	7710			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	7.9	B		P
7440-09-7	Potassium	800	B		P
7782-49-2	Selenium	3.1	U	N	P
7440-22-4	Silver	1.7	B		P
7440-23-5	Sodium	631	B		P
7440-28-0	Thallium	4.9	U		P
7440-62-2	Vanadium	1.4	U		P
7440-66-6	Zinc	16000			P
	Cyanide				NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

EPA SAMPLE NO.

## INORGANIC ANALYSIS DATA SHEET

MJAF74

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18413S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	20900		J	P
7440-36-0	Antimony	14.1	B	N US	P
7440-38-2	Arsenic	862			P
7440-39-3	Barium	9.8	B		P
7440-41-7	Beryllium	9.1			P
7440-43-9	Cadmium	1530		J	P
7440-70-2	Calcium	53500		J	P
7440-47-3	Chromium	11.1			P
7440-48-4	Cobalt	214		J	P
7440-50-8	Copper	856		#J	P
7439-89-6	Iron	1510000			P
7439-92-1	Lead	1240		J	P
7439-95-4	Magnesium	106000		J	P
7439-96-5	Manganese	173000			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	228		J	P
7440-09-7	Potassium	788	B	J	P
7782-49-2	Selenium	74.7		#J	P
7440-22-4	Silver	59.3		J	P
7440-23-5	Sodium	23000		J	P
7440-28-0	Thallium	68.4			P
7440-62-2	Vanadium	1.4	U	J	P
7440-66-6	Zinc	852000			P
	Cyanide				NR

04/12/99

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:



EPA SAMPLE NO.

## INORGANIC ANALYSIS DATA SHEET

MJAF75

Lab Name: SENTINEL, INC.

Contract: 68-D5-0167

Lab Code: SENTIN

Case No.: 26852

SAS No.:

SDG No.: MJAF64

Matrix (soil/water): WATER

Lab Sample ID: 18414S

Level (low/med): LOW

Date Received: 03/02/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	468	—		P
7440-36-0	Antimony	3.5	U	N	P
7440-38-2	Arsenic	61.6			P
7440-39-3	Barium	19.2	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	65.6			P
7440-70-2	Calcium	7970			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	15.1	B		P
7440-50-8	Copper	64.4		EJ	P
7439-89-6	Iron	36300			P
7439-92-1	Lead	981			P
7439-95-4	Magnesium	5610			P
7439-96-5	Manganese	6750			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	16.7	B		P
7440-09-7	Potassium	1380	B		P
7782-49-2	Selenium	3.1	U	N	P
7440-22-4	Silver	2.1	B		P
7440-23-5	Sodium	549	B		P
7440-28-0	Thallium	4.9	U		P
7440-62-2	Vanadium	1.4	U		P
7440-66-6	Zinc	19800			P
	Cyanide				NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments: